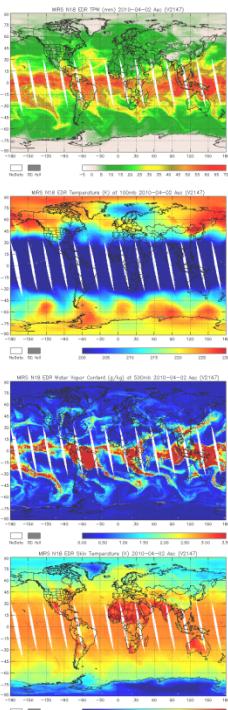


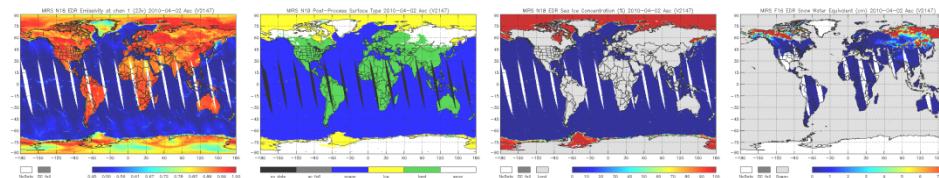
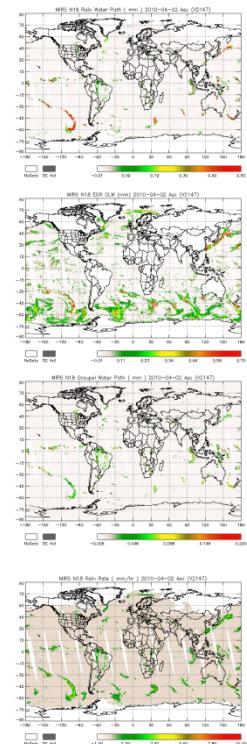
Future Plans for NOAA's Microwave Integrated Retrieval System

Kevin Garrett¹, Christopher Grassotti¹, Leslie Moy¹, Flavio Iturbide-Sanchez¹, Wanchun Chen², and Sid-Ahmed Boukabara³

NASA Sounder Science Team Meeting
Greenbelt, MD
November 4, 2010



1. I. M. Systems Group 2. Dell, Inc. 3. NOAA/NESDIS/STAR, JCSDA





Agenda

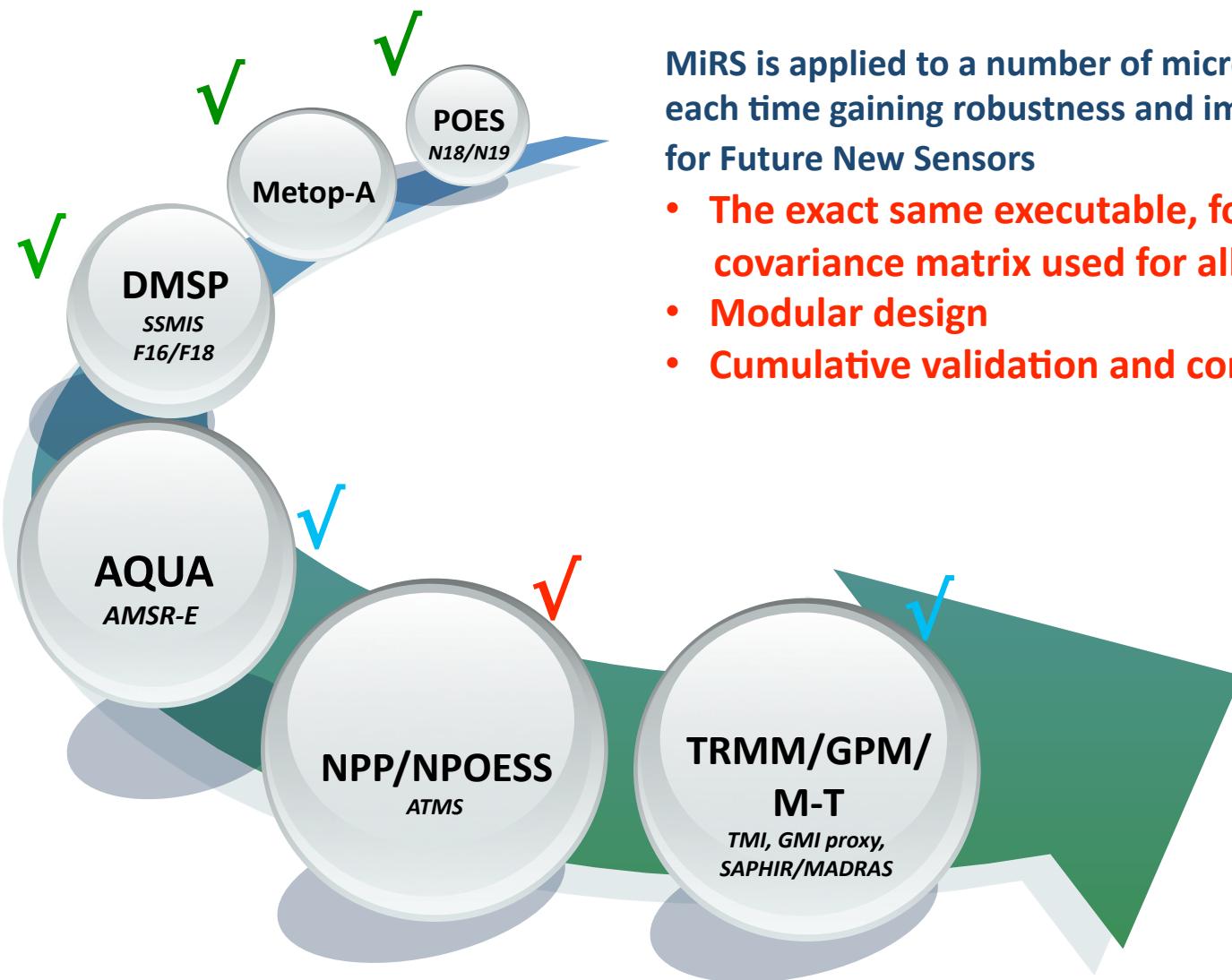
- Overview of the Microwave Integrated Retrieval System (MiRS)
- The MiRS Validation and Testbed
- Ongoing Efforts
- MiRS Future Sensors
- Summary

Overview



- NOAA/NESDIS/STAR has developed a flexible physical algorithm: the Microwave Integrated Retrieval System (MiRS)
 - Can be applied to any microwave sounder/imager
 - 1DVAR approach using CRTM as forward and jacobian operators
 - Retrieves sounding and surface parameters simultaneously, including hydrometeor profiles and surface emissivity
 - Applicable over all surfaces and in all-weather conditions
 - Run operationally at NOAA OSDPD (and integrated at NDE for NPP/JPSS future processing)
 - MiRS is currently being extended to support GPM

MiRS in Context



MiRS is applied to a number of microwave sensors, each time gaining robustness and improving validation for Future New Sensors

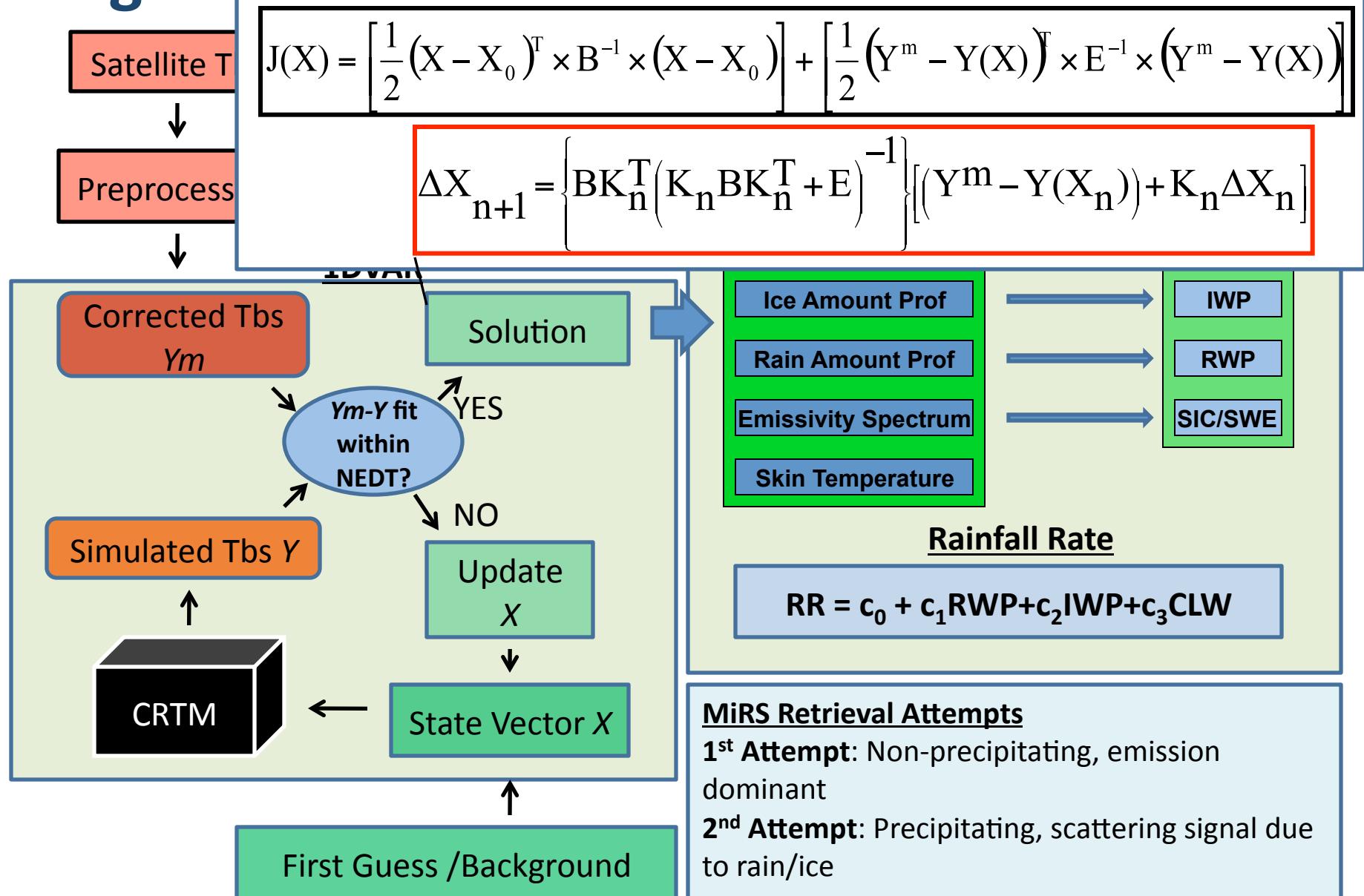
- The exact same executable, forward operator, covariance matrix used for all sensors
- Modular design
- Cumulative validation and consolidation of MiRS

✓: Applied Operationally

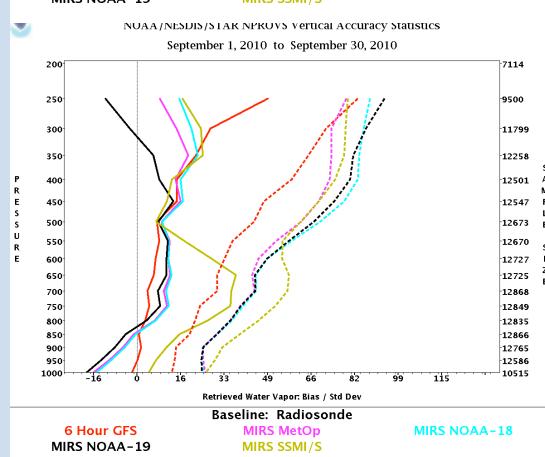
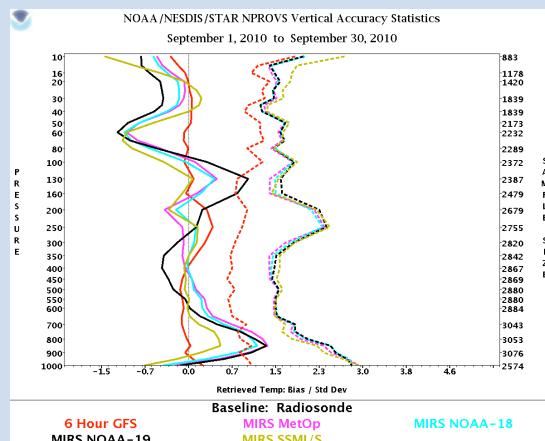
✓: Applied occasionally

✓: Tested in Simulation

Algorithm Description

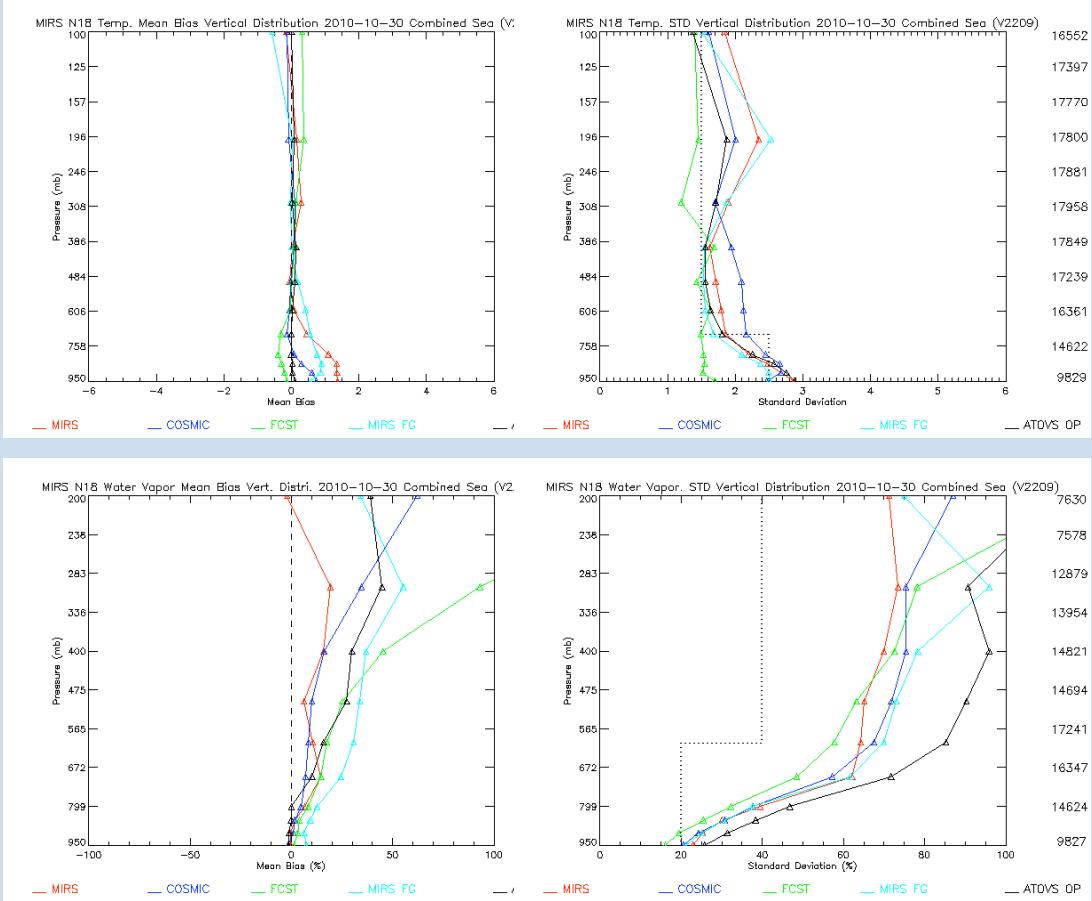


Validation Efforts



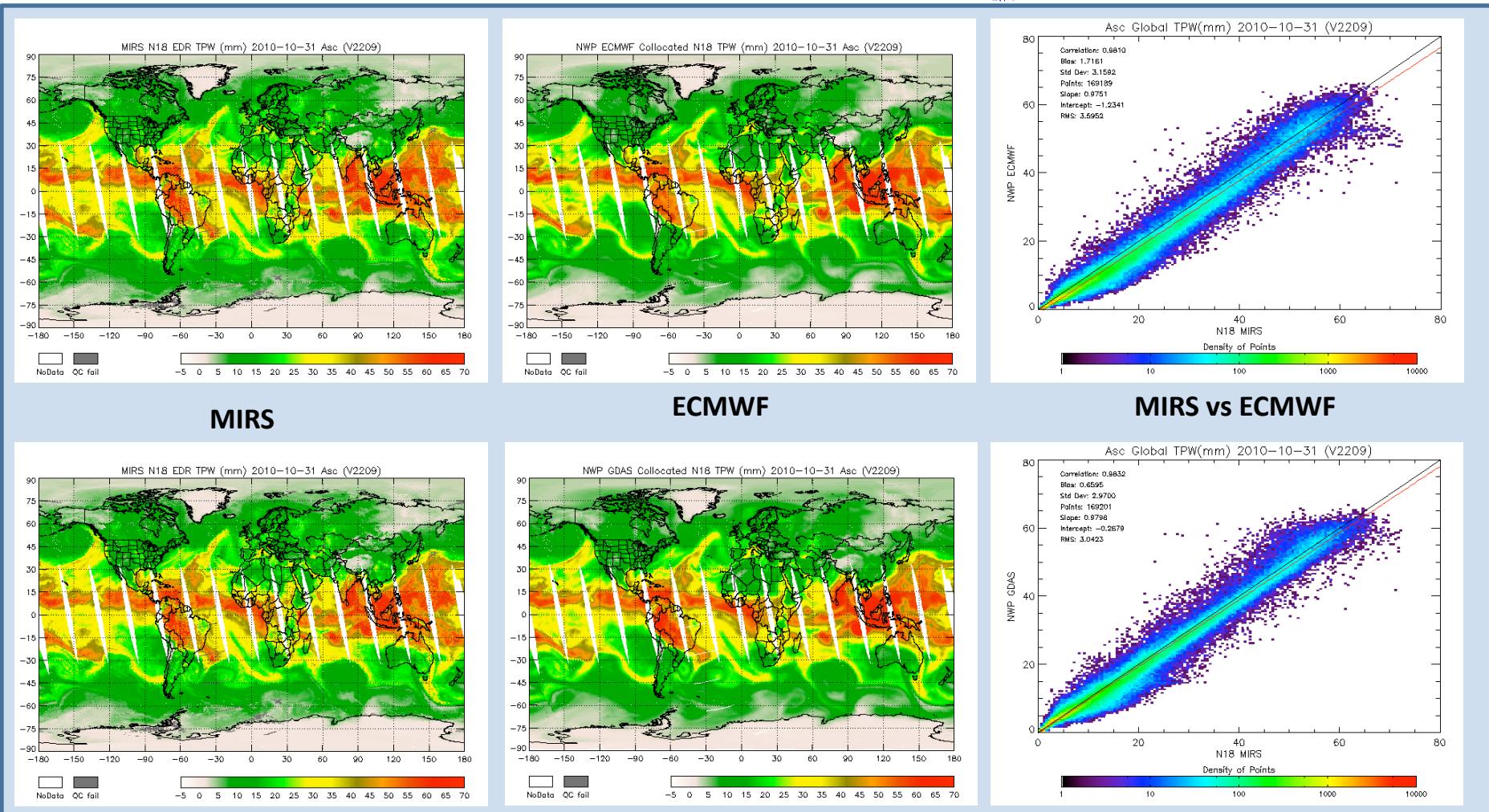
**Independent Assessment from the
NOAA Products and Validation System
September 2010 matchups**

NPROVS images courtesy of Tony Reale
www.star.nesdis.noaa.gov/smcd/opdb/poes/NPROVS.php



Internal Comparisons of MiRS to RAOB and other Sounding Datasets for Temperature (top) and WV (bottom) over Ocean. Record extends from April 2008-current

MiRS Testbed

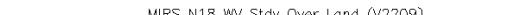
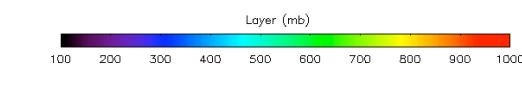
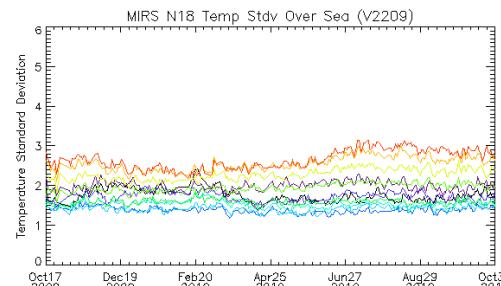
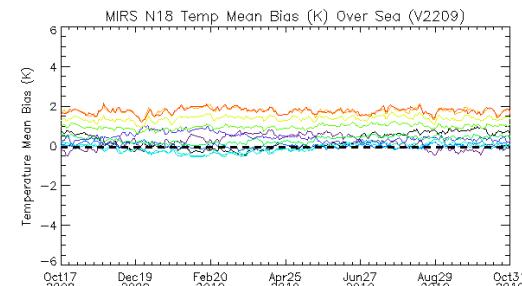


MiRS TPW Comparisons to Collocated ECMWF Analysis (top) and GDAS (bottom) for October 31, 2010.

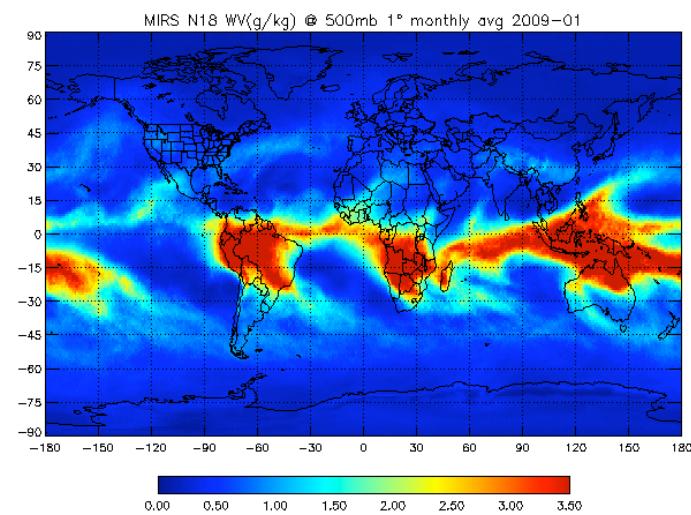
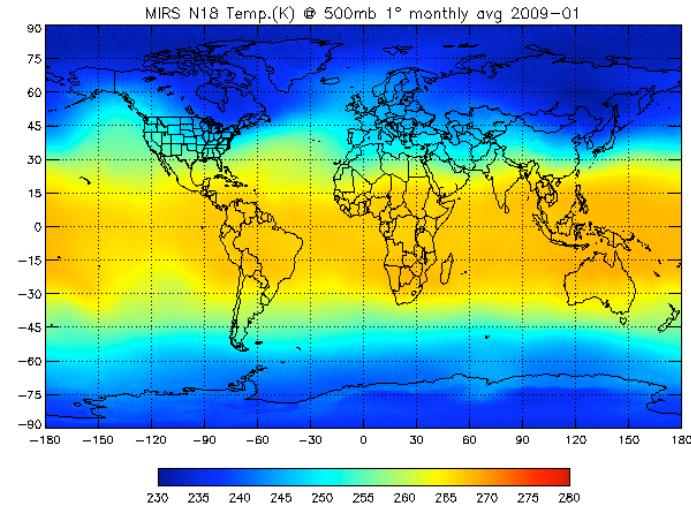
MiRS Testbed



Statistical Trends



Climatologies

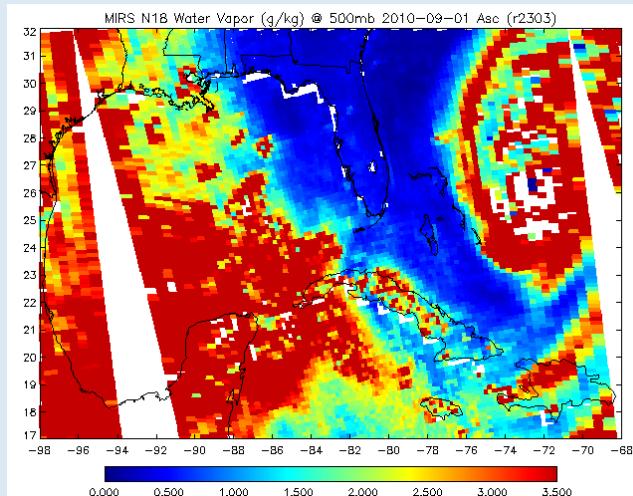
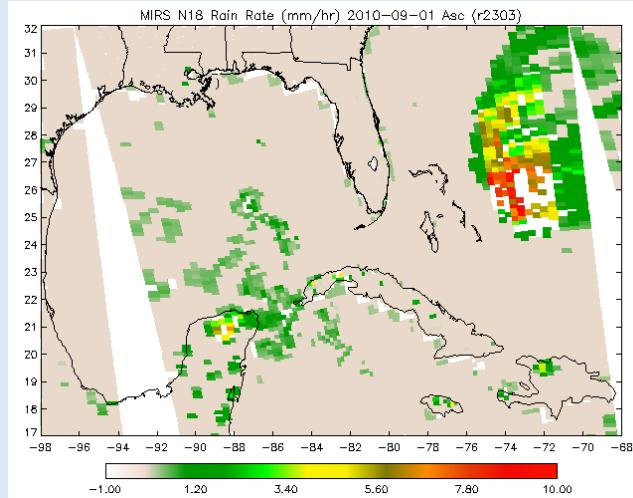


Time series of Temperature bias and standard deviation over Ocean (top) and Water Vapor bias and standard deviation over Land (bottom) vs ECMWF analysis

Ongoing Work

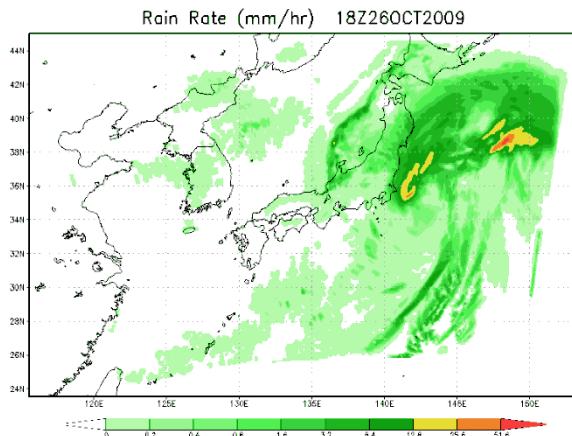


- Improvement to soundings in precipitating conditions, especially extreme events
 - Includes not only T, Q, but also hydrometeor profile retrievals
- Approach:
 - Stratify constraints by season/latitude for rainy cases (background and covariances)

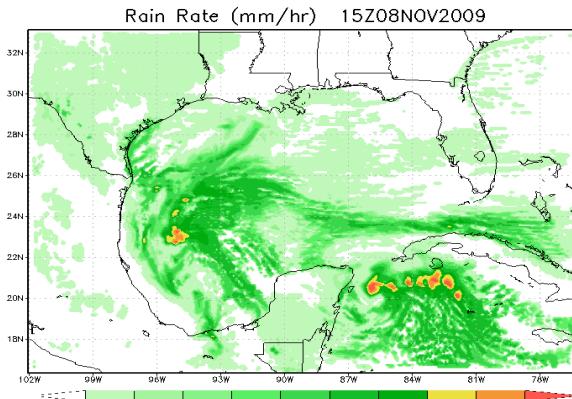
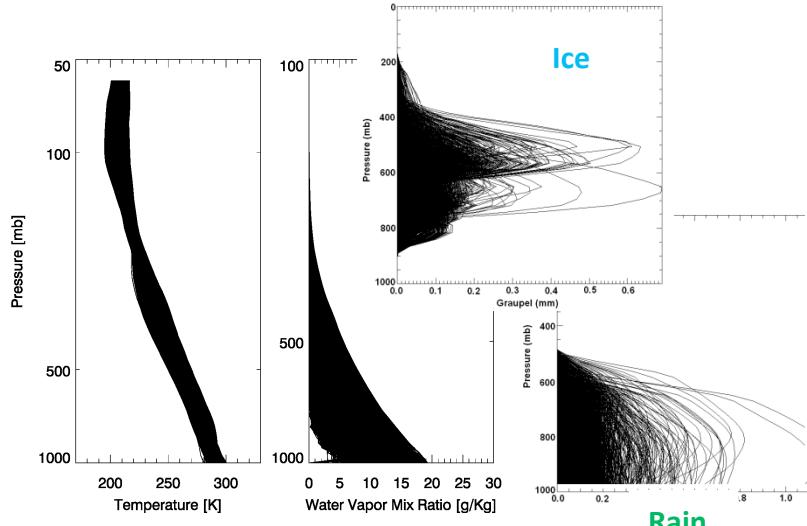


MiRS retrieved Rainfall Rate (top) and 500mb Water Vapor over Hurricane Earl

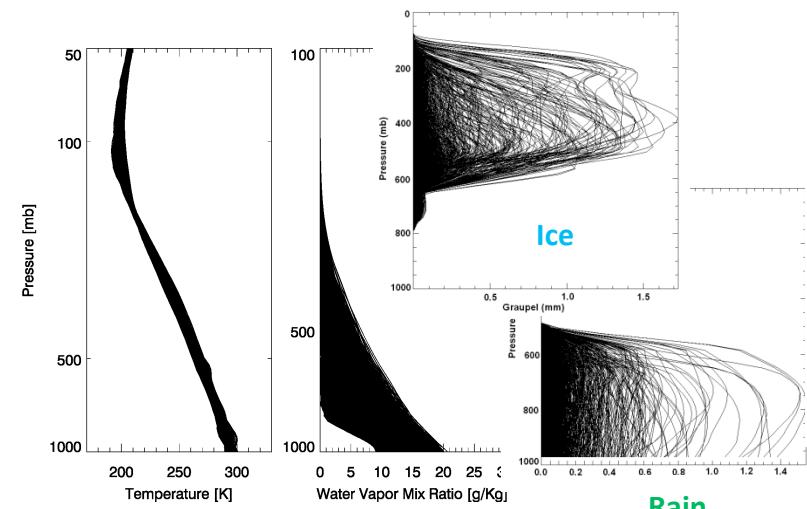
Ongoing Work



Mid-latitude Profiles

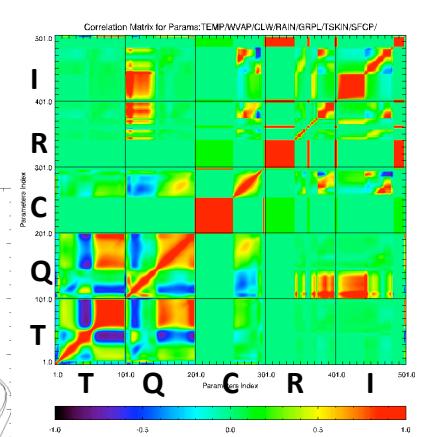
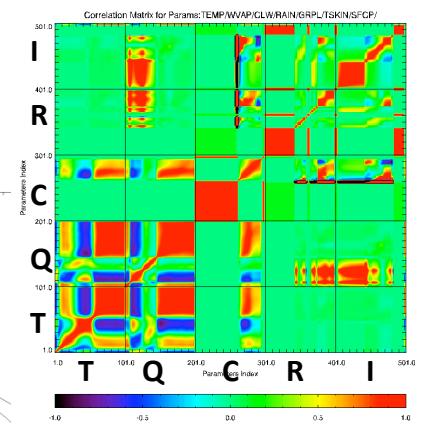


Tropical Profiles



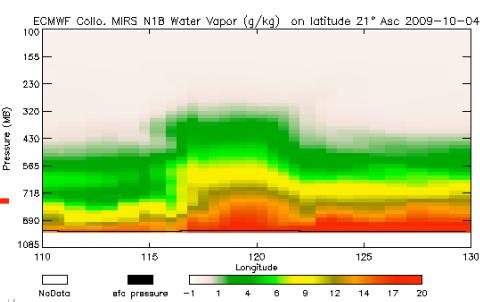
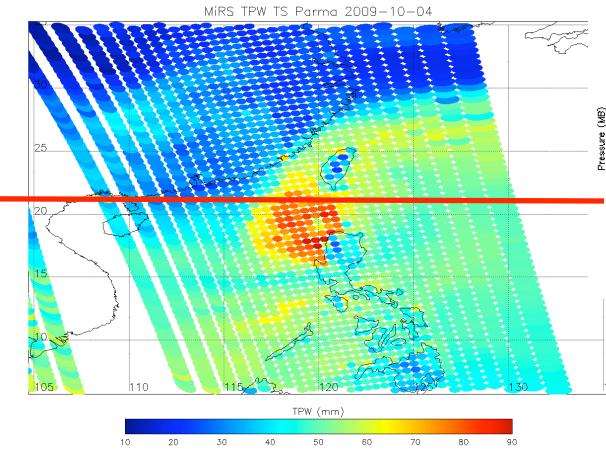
WRF Model Simulations

Temperature, Water Vapor, Rain and Ice Profiles

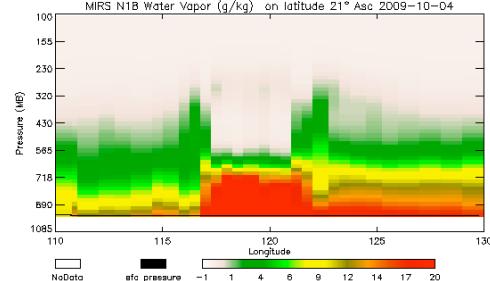
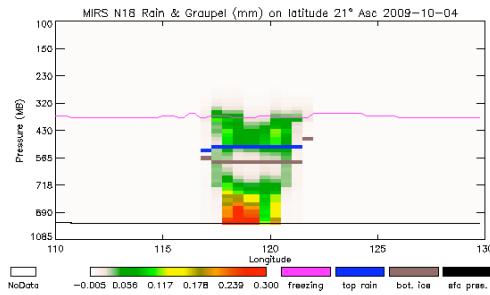


Correlation Matrix between
T, Q, Cloud, Rain and Ice

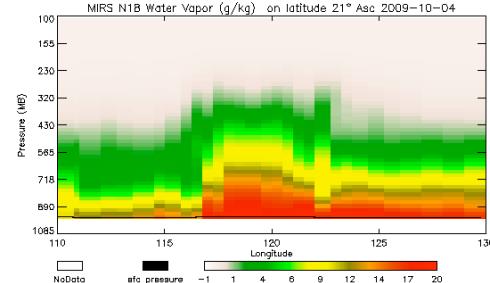
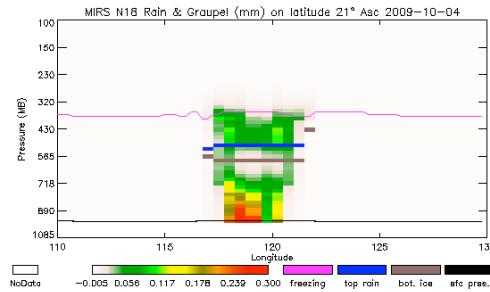
Ongoing Work



MiRS TPW during TS Parma (left) and ECMWF Analysis Water Vapor Vertical Cross-section (right) along 21° latitude



MiRS Rain/Ice (top) and Water Vapor (bottom) Vertical Cross-sections along 21° latitude using Global covariances

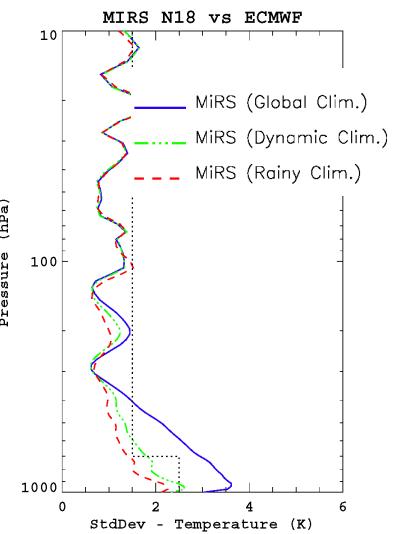
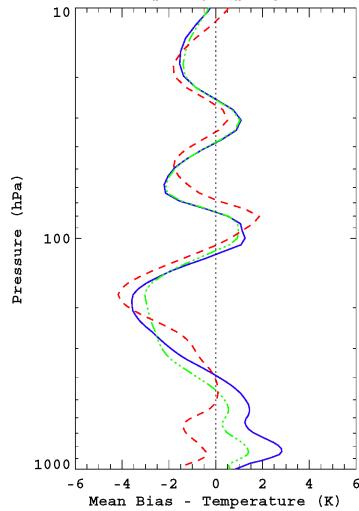


MiRS Rain/Ice (top) and Water Vapor (bottom) Vertical Cross-sections along 21° latitude using Rainy covariances

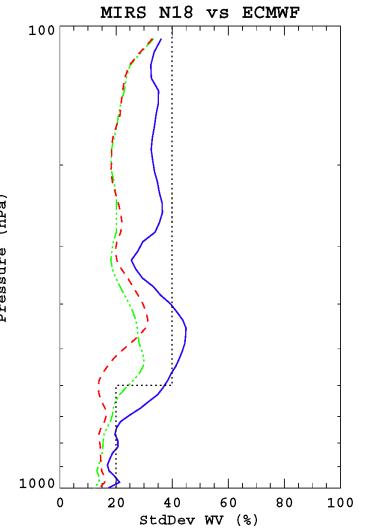
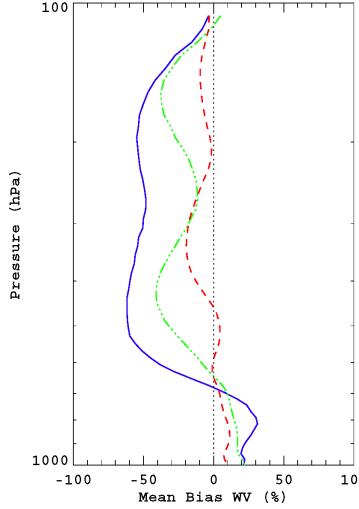


TM3G

MiRS N18 vs ECMWF



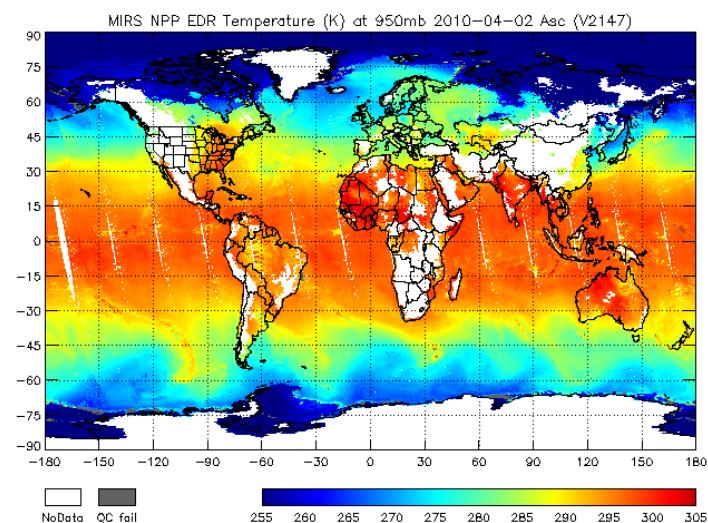
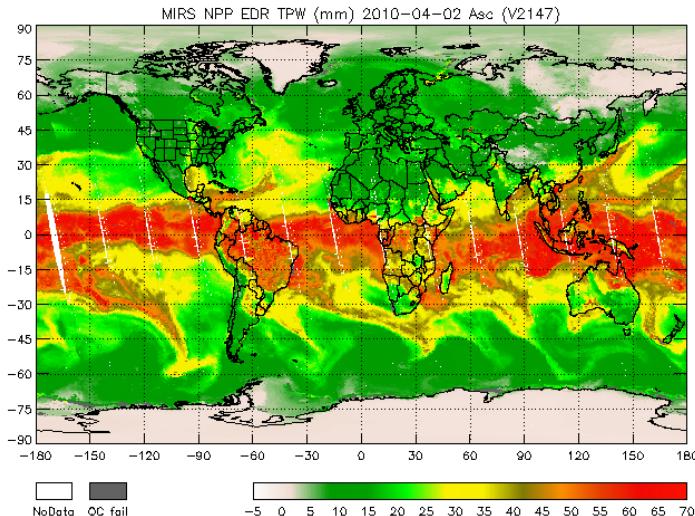
MiRS N18 vs ECMWF



MiRS Sounding Performances using Global covariances (blue) and Rainy covariances (red) for Temperature (top) and Water Vapor (bottom)

Future Sensors

- MiRS has been extended to NPP ATMS
 - Processing proxy data daily at STAR
 - Operational July 2012?
- MiRS will be extended to the Global Precipitation Mission Microwave Imager
 - GMI is similar to TRMM Microwave Imager with additional high frequency channels (166 and 183 GHz)
 - MiRS has been extended to real TMI and GMI simulated data
- MiRS will also be extended to Megha-Tropiques SAPHIR/MADRAS
- DMSP F-19, Metop-B....



Summary



- MiRS is an operational algorithm at NOAA/NESDIS which provides operations sounding products
- Near term improvements to sounding in heavy precipitating conditions
- MiRS algorithm being extended to NPP ATMS, TRMM TMI, GPM GMI, M-T in the short term
- Website

<http://mirs.nesdis.noaa.gov>